ELEMENTS OF COMETARY ORBITS.

Verzeichniss der Elemente der bisher berechneten Cometenbahnen. By Prof. Dr. J. G. Galle. (Leipzig: Wilhelm Engelmann, 1894.)

THE volume which we have before us contains, as its title indicates, a list of the orbits of all those comets which have up to the present time been calculated. As our readers may already be aware, this is not the first "Verzeichniss" with which Prof. Galle has presented us, for one has only to refer to the second edition of "Olber's Methode zür Berechnung der Cometenbahnen," by Encke, where will be found a collection of the orbits of comets which had appeared up to the year 1847. In the following or third edition, which came out in 1864, the list was expanded, revised, and brought up to date. The present "Verzeichniss" has, however, assumed larger proportions than its predecessors, containing as it does over 300 pages, and so is published as a separate work.

In the introduction the author sums up in a few words the chief points about the numerous lists of cometary orbits which have been published from time to time, referring chiefly to the different ways in which they have been arranged and compiled.

Several changes from preceding lists have been adopted in the book before us, and we will chiefly restrict ourselves to a brief statement of the same. It may be mentioned here that the order of the elements of the same comet has been so chosen that the less accurate elements precede those which have been considered more correct, so that the last elements in every case are those which approach nearest to the truth.

Two important alterations concern the removal of the distinction between direct and retrograde moving comets, and the way of representing the inclinations of orbits from 0° to 180°. Instead of the Longitude of Perihelion (π) being adopted, Prof. Galle employs the angle between the node and the perihelion point, that is, he introduces an angle ω, which equals the Longitude of Perihelion minus the node, so the relation may be represented by $\omega = \pi - \Omega$. The arc ω has been termed the "Argument of Perihelion," and is somewhat analogous to the "Argument of Latitude" ($u = v + \pi - \Omega$), so that ω is the Argument of Latitude for $v = 0$, or is Perihelion point.

To pass from the "Argument of Perihelion" ω, to the "Longitude of Perihelion" π, without distinguishing between direct and retrograde movement, the simple relation $\pi = \Omega + \omega$ is used. On the other hand, if, after the old style in the case of retrograde moving comets, the Longitude of Perihelion is denoted by the difference $\Omega - \omega$ and represents this by π', and if also i' denotes the value of the inclination in this case only as far as 90°, then the relation for the reduction is as follows:

$$\pi + \pi' = 2\Omega. \quad i + i' = 180°.$$

Following the columns dealing with the position of Perihelion, the Node, and the Inclination, are others giving the logarithms of the Perihelion distance, and the eccentricity, concluding with the names of the computers of each of the orbits and the references in every case.

In addition to the above, we have no less than 160 pages of remarks and literature references, which will be found invaluable by those searching for special information about any particular comet. Perhaps a brief note will best serve to give the reader some idea of the style in which the author has brought together the information. The subjoined note, picked out at random, is typical of the method followed.

No. 356. 1883 II. Discovered 1884. January 7, by Ross in Elsternwick, at Melbourne, observed only for a few days in the southern hemisphere and in Madras, by Ellery in Melbourne until February 4, still approaching February 7 and February 19. At first visible with the naked eye, then afterwards dimmed quickly and difficult to observe—*A.N.* cviii., cix. *M.N.* xliv., xlv. *Observatory* vii. NATURE xxix.—*Tebbutt's* elements are computed from the observations made on January 19, 23, 28. *Tennant's* from those of January 17, 26, 30. *Bryant's* from three normal positions January 19, 25, February 2. *Ellery's* from those of January 12, 18, 28. Oppenheim's from those of January 12, 18, 28, 29, February 4. Three computed ellipses, one by Tennant and the other two by Bryant, in *M.N.* xlv. and xlvii., have been omitted, so also an approximate orbit by Hind in NATURE xxix.—All the above-mentioned orbits are referred to the M.E. 1884, 0.

As a rule the notes are much longer than the above, some, such as those which relate to comets 1880 I., 1881 III., 1882 I., 1882 II., 1889 V., &c., extending over a page or more.

In the compilation of this work, the thoroughness with which it has been done is a striking feature throughout, and Prof. Galle deserves the thanks of all astronomers for the completion of this volume. The information is brought up to the beginning of this year, thus making the book, besides the best, the most recent of all other lists. W. J. L.

OUR BOOK SHELF.

Primary Geography. By A. E. Frye. Pp. 128. (Boston U.S.A.: Ginn and Co., 1894.)

WE have never seen a class-book of geography more profusely and admirably illustrated than the one under review. Our only regret is that the book, being written for schools in the United States, possesses the eccentric or reformed orthography that obtains there. This, in conjunction with the fact that the British Isles are dismissed in less than a page of text, renders the volume unsuitable for use in our schools. We hasten to remark, however, that the author has not merely concerned himself with the interests of the United States, as a brief statement of the various sections in his work will show.

The book opens with what is called "Home Geography," which section deals with elementary facts of physical geography observable at any place. The earth is next studied from an astronomical point of view; and then follow descriptions of the slopes of the earth. After describing the surface features of the different continents, the author passes to an account of the peoples of the earth, and then to meteorological phenomena. This is followed by sections on plants and animals, and finally commercial geography is treated, the continents being taken in succession. The book has so many excellent points that we can only mention a few of them. One is that the text on people refers to child-life, and must therefore appeal to children more than references to cheek-bones and the texture of hair. Plants and animals are studied in their relations to climate and physical features, and thus a clear idea as to the causes affecting